These drawings, in conjunction with those previously sent, prove beyond doubt that the "band" and "wine-glass shaped channel" from it, are permanent features of the planet, and that any apparent change in them arises from the various aspects that are presented by the planet itself, as seen from the Earth.

In addition to the above set of drawings, I send copies of those already sent for the oppositions in 1862, 1864, and 1867, arranged so that the corresponding drawing for each appears under that for the previous opposition, thus showing the apparent changes, and facilitating their comparison.

Waterloo, near Liverpool, 10 *May*, 1871.

On a Free-Regulator Clock. By Sidney B. Kincaid, Esq.

The common pendulum-clock is essentially a very imperfect adaptation of theory to practice, because, while the theory contemplates a body swinging under the action of a *constant* force, in practice it is influenced by forces so various that it is only with the utmost difficulty that a clever workman can render their sum approximately constant in a clock of moderate size, and when the requirement that it should drive a pair of large hands on a weather-dial necessitates construction on a scale belonging rather to the province of the engineer, it is deemed indeed a triumph of skill to produce a timepiece which can be depended on as such for any lengthened period without frequent correction by the transit-instrument.

I would now submit to the Royal Astronomical Society a plan in which, by making the regulator mechanically free of the going and recording apparatus, the difficulty of construction I have referred to is obviated, inasmuch as a slight want of care and accuracy in the finish of these latter parts of the clock does not tend to impair the exactness of its performance.

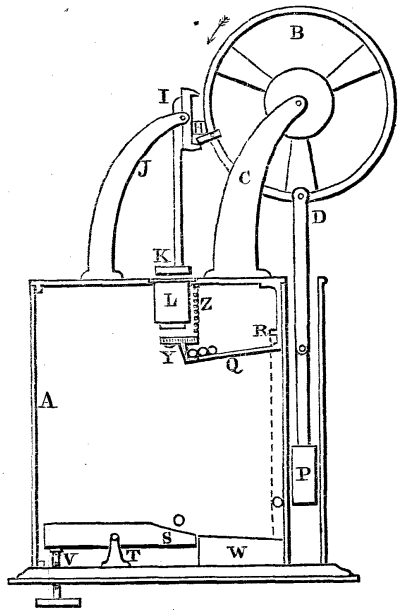
I propose, as will be seen, to substitute for the pendulum as the controlling agency, iron spheres falling *in vacuo*, and to record the falls and replace the spheres by means of a galvanic current. No doubt some unaccustomed to its use may feel prejudiced against the employment of electricity, but with a self-amalgamating Smee, or a constant, battery, there need be no much trouble about it.

In the diagram:—

A, is the case, exhausted of air to prevent unequal resistances due to changes of temperature.

B, a wheel (C its support) on the axis of which and connected to it is a pinion, such that if $\frac{1}{t}$ be the fraction of a second occupied by the falling of a ball, 60 t turns of B make one turn of seconds-wheel of clock. To the edge of B is fixed by a loose pin,

D, a rod carrying the permanent magnet P, which slides up and down against outside of case.



H, is the pin of C, which engages the escapement I (J its support) to which is attached the armature K acted on by the electro-magnet,

L, within the case. *Inside* the case are also,—

Y, the release-piece with its spring Z:

O, a lever turning on centre T and resting in its normal position on the screw V, by which the circuit is closed between battery and magnet:

W, the lower inclined plane.

R, a stop just above Q, and,

Q, the upper incline.

Y is supported by two standards, not shown in diagram, constructed on principle of gridiron pendulum, so that its height may be the same at all temperatures. For the sake of clearness the electrical connexions are also omitted.

The action of the apparatus is as follows:—

A ball having fallen, immediately that it meets S, it breaks contact, the piece Y tilting sideways then instantly disengages another ball, and the escapement armature K no longer being held by the magnet, allows the wheel B to be turned once by the clock train, this raises the magnet P, drawing up the ball on W until it meets the stop R, which releases it from the magnet, and leaves it to roll against a stop-pin and against Y, and lets (P) down again; meanwhile the ball which fell has rolled down S and W into position to be picked up in its turn, and S being relieved of its weight, contact is restored; when the next ball strikes S the same movements take place. A guard-pin prevents more than one ball being liberated at once by Y. Of course L must be so placed as not to act directly on the balls.

Trinity College, Cambridge, May 6, 1871.

On η Argûs. By J. Tebbutt, Esq.

The accompanying table exhibits the results of comparisons of *η Argûs* made by me during the period 1854–1870. The magnitudes of the comparison stars employed down to the end of 1863, have been taken from Tables A and C on pp. 334, 341, of Sir J. Herschel's *Results of Astronomical Observations at the Cape of Good Hope*, 1834–8. For all the observations since